EQUITABLE HYDRANT RENTALS AND BETTER METHODS FOR APPORTIONING FIRE PROTECTION COST

By John W. Alvord

Probably no one thing has contributed so much to the friction between private water companies and municipalities as the common and antiquated method of paying for fire protection at a fixed sum per hydrant. It is the purpose of this paper to point out some of the evils resulting from unscientific apportionment of fire protection costs, and show how they can be remedied.

In the formation of so many new utility commissions as are now created, and are being created, there arises the opportunity to obtain a more equitable and scientific adjustment of rates than has hitherto prevailed. The Wisconsin commission has already done valuable work in showing that many of the municipalities in Wisconsin do not pay enough for public fire protection; that is to say, that the cost of the public fire protection system is in considerable part loaded onto the private consumer. It is a matter of common knowledge among those who study this subject that this is largely true all over the country. This condition doubtless arose from the fact that when franchises were originally granted, it was easier for city councils to grant and water company promoters to obtain concessions for a slightly larger domestic rate, which came from many small consumers, than a proper and just public payment coming from a usually insufficient and ordinarily depleted general fund.

The injustice of this proceeding is fully evident when a careful study of the two services is made. The valuable paper on this subject by Messrs. Kuichling, Hawley and Metcalf, presented to the American Water Works Association at the Rochester meeting, shows generally that with the smaller cities fire protection cost rises to a 65 or 75 per cent proportion of all the service, while in the larger cities this may be as low as to 20 and 25 per cent.

The Wisconsin commission has, as the result of its studies, generally raised the fire protection cost, and correspondingly lowered the domestic rate in the following cases:

DATE OF REPORT	CITY	POPULATION 1910	PER CENT OF WATER WORKS CHARGED TO FIRE SERVICE	ANNUAL CHARGE FOR FIRE SERVICE
1910	Jefferson, Wis.	2,582	75.0	$2,560
1910	Ripon, Wis.	3,739	65.0	6,082
1911	Oconto, Wis.	5,629	57.5	9,812
1909	Ashland, Wis.	11,594	54.5	20,480
1911	Janesville, Wis.	13,894	54.0	15,795
1911	Beloit, Wis.	15,125	48.0	14,863
1910	Madison, Wis.	25,531	49.6	About 17,000[1]

It is safe to say that in most instances where private utilities are serving the community, the city is paying less than half of the amount which properly should be paid for this service, thus loading the balance of the cost usually on to the small private consumer.

In the case of a municipality which owns its own plant, and has largely paid for it from issues of bonds, paid from annual taxes, the fixed charges are perhaps more equitably distributed, but it is yet an open question, even in such cases, if a careful study would not disclose that the consumer is not paying more than his proportion for the public service, by reason of the fact that he virtually bears all the operating cost.

The proper method of dividing the cost of public and private services is, (1) to make a valuation of the plant; (2) to make a study of the value of a theoretical plant, sufficient in capacity for fire service only, and (3) a study of the value of a theoretical plant, capable of domestic service only. The sum of the (2) and (3) study will give a value much greater than the value of the combined plant, and the value of the combined plant should then be divided between fire service and domestic service in proportion to the theoretical values found necessary in each case. To illustrate: if the cost of a combined fire and domestic service in a single plant is found to be $100,000 for a given community, and the cost of a strictly fire service plant is found to be $80,000, and a strictly domestic supply plant $70,000, or a total for two separate plants of $150,000 for the same community, then the value of the combined plant should be divided between the two services on the basis of eight-fifteenths and seven-fifteenths of the total value of the combined plant, or about $53,400 for the proportionate investment for fire service, and about $46,600 for the proportionate investment in domestic service.

[1] Special local conditions favor a low fire service charge at Madison.

In addition to this study, it is necessary to inquire, in the same manner, into the operating expenses, and divide the combined operating expenses between those chargeable to fire service and domestic service. Here it will be usually found that domestic service carries the higher charge.

Having found the total investment in each service, and computed its interest and depreciation, and added to this the proper proportion of operating expense, we have a proper and equitable division of annual revenue which should be derived as between the private consumer, on the one hand, and the public fire protection expense, on the other, and, as has been before said, it will be usually found that the public is not paying nearly enough for the public service and the private consumer is bearing the burden.

Here, therefore, is an opportunity for our public service commissions to do some scientific rate making, easing the burden particularly on the small consumer and placing it where it justly and properly belongs, on the general public.

But more than this can be done. When the proper amount for the public to pay for general fire protection is properly ascertained, it can be more scientifically applied than under the present irrational method so that it will not result in the constant friction that the present method involves.

The method of paying for fire protection at so much per hydrant is very common, but it is illogical and improper for the following reasons:

1. It does not apply the payments to what the public really pays for, viz., pumping capacity, distribution capacity, and the size and number of fixture openings.

2. The present method has a tendency to contract the fire-fighting efficiency, by concentrating the payment on an outlet fixture, thus constantly tempting the cities to improper economy by the neglect to install the proper number and closer spacing of the hydrants, with increasing fire risk in any given district.

3. The present method spreads the cost of fire protection inequitably, in that Cities have to pay for outlying districts, with low fire protection risks, as much per hydrant as in central business property, with high protection risks.

4. It discourages the extension of the distribution system into outlying districts, by reason of the relatively high cost of the hydrants needed.

5. It does not encourage the use of adequate sized mains, because attention is concentrated on the outlet fixture and its spacing rather than the size and capacity of the distribution system.

6. It discourages the setting of additional and intermediate hydrants when the adjacent fire risks increase, even though capacity of mains may be available.

7. It makes for constant contention between the city and the company whenever new hydrants or new extensions are needed, by reason of the above facts, which neither the company or the city officials are always able to fully analyze or understand. Thus we have these two important interests in constant antagonism where both should be in harmony in working for a common end at a just cost.

Many of the bitterest contests between private companies and municipalities arise from this cause.

Now, all this source of contention and friction can be entirely avoided by a more proper method of payment for the public service, which will eliminate the objections above made, and place the burden of cost where it belongs; that is to say, in the capacity of the system for fire protection rather than on the number and spacing of outlet fixtures. Just as it is more equitable to sell water to the private consumer per unit of volume, by meter, rather than by number of outlets in the consumer's home, so is it more equitable to pay for fire protection per unit of capacity for fire protection purposes rather than mainly by unit of outlet fixture. In other words, let us pay the company for the amount of capacity it has in its pumping and distribution system, as well as for the number of outlets and we will have destroyed most of the sources of friction that now exist.

The method that first suggested itself to the writer was to apportion fire protection cost in part to pumping capacity, in part to pipe distribution capacity, and in part to outlet, but on reflection it was seen that this triple division produced some complexity, which was not really needed, and which did not make for simplicity.

It is comparatively easy for cities to enforce the installation of adequate pumping capacity, and where pumping capacity does not amply exist it is not difficult for water companies to enlarge it in fairly reasonable length of time. Attention is constantly directed to deficient pumping capacity and its future lack is not difficult to foresee.

But the enlargement of distribution pipe capacity up to the level of a constantly growing population is not so easily accomplished. Its

lack is produced by insidious neglect, of which the manager, the administration, and the public has no warning note. It is here, if anywhere, that we need in the ordinary plant and city to have an incentive to upkeep and enlargement. It would, therefore, appear that for purposes of simplicity, it would be fully as effective to proportion fire protection payments in large part on pipe distribution capacity, and in small part on outlet fixture payments, as to proceed in a more complex manner by including pumping capacity.

With this principle in view, and having arrived at the proper amount to be paid the utility for fire protection by the methods herein first described, it remains to apportion this amount in such a way that incentive is introduced to properly install mains and distribution system of the proper size, and hydrants of the proper spacing, so that the fire risks will be proportionately met in different sections of the town, and at the same time, so that extensions and additional hydrant rental will not be burdensome, and, in short, that all or most of the causes of friction between the municipality and the utility enumerated above will be removed.

This can be done by paying for the fire service in large part per mile of pipe at rates depending on its capacity.

For the purpose of having some regulating limit, it is also desirable to pay for the hydrants a small sum, which represents a reasonable return on their cost of installation, together with an allowance for their depreciation and annual maintenance. This in reality amounts to a nominal sum, generally not more than $5 to $8 per annum per hydrant. At this rate it should be the privilege of the city to order in as many or as few hydrants as proper attention to the relative fire risks of the different sections of the city would seem to demand. A proper appreciation of the rapidity with which long lines of fire hose reduces pressure would undoubtedly make for a liberal allowance of hydrants under such a scale of payment.

The company, being paid an annual sum for the hydrants and their maintenance, has no separation of interest from the viewpoint of the municipality.

The bulk of the payment for fire protection under such a system should come from the pipe capacity unit.

The pipe capacity unit does not need to be scientifically exact; it is sufficient for all practical purposes if it is only approximate, and particularly desirable that it be simple.

The best unit which has occurred to the writer, that approximates

in some degree the relative cost and capacity of mains sufficiently for this purpose, and is at the same time simple, is the inch foot of diameter; that is, the number of inches of diameter 1 foot long in a given system of distribution pipe. Thus, a 6 inch pipe is rated at 6 inch feet to every foot, and a 12-inch pipe 12 inch feet to every foot.

Having found the total amount of money to be paid for fire service in a given system, we should deduct the amount that will be raised by the nominal hydrant rental before described, and we should also deduct the amount which will be raised from sprinkler systems and other especial methods of fire protection, and the remainder will be the amount to be paid by the city on the pipe capacity unit or inch foot basis. The total number of inch feet in a given system, divided into the amount to be raised by this part of the protection, will give us the cost per inch foot. This will probably fall in most normal cases within $\frac{4}{10}$ to $\frac{7}{10}$ of one cent per inch foot.

The total annual payment then for any given pipe will be its diameter times the inch foot unit times its length.

Thus, if the inch foot unit is a half a cent, a 6-inch pipe will have a fire protection rental of 3 cents per foot per annum, and a 12 inch pipe will have a rental value similarly of 6 cents a foot annually.

To this amount computed for all the pipe lines should be added the nominal hydrant rental computed on the total number of hydrants, the total making the annual public fire protection bill to the city.

It is true that the cost and capacity of mains increase at a rate greater than the first power of the diameter. The capacity increases as the square of the diameter, and the cost between the first power and the square. If the cost of mains is increased by the replacement cost of cutting through pavements, the adjustment of cost as between different diameters will be closer.

A uniform rate per inch of diameter is a slight inducement toward the smaller pipe, as that has the larger return, and this may be equalized (if it is thought wise) by a sliding scale, but, as a matter of practical effect, it is not believed that the variation will have any appreciable influence in keeping down the capacity of the distribution system.

The advantageous features of this arrangement are:

1. That the city proportions its payment to the amount of distribution pipe capacity it receives, as well as the number of fixture openings (hydrants) that are available

2. The payments for fire protection are usually and normally in

proportion to the fire risks in the different districts, because the larger mains are in a general way either within, or lead to, those districts most fully built up and most needing fire protection.

3. There is every incentive to the company in extending its distribution system, to keep sizes of mains up to the fire requirements, and to reinforce weak districts, and the cities' interest in fire protection and the companies' interest in proper remuneration are thus coördinate.

4. In outlying districts the city does not have to pay for protection out of all proportion to the capacity needed, and it may further regulate the number of hydrants in such districts to suit their character and growth.

5. There is no obstacle to the introduction of new hydrants when given districts need increased fire protection, and thus the fire department is rendered much more efficient.

The writer, in company with Dean F. E. Turneaure of Madison, Wisconsin and Dean Marston of Ames, Iowa, was appointed in 1912 as a board of arbitration to determine the value of the water works property, at Freeport, Illinois, decide upon the necessary enlargement of the plant, fix a schedule of fair rates, and draw up an ordinance for the extension of the franchise, should the city determine to extend rather than purchase.

This opportunity was taken to introduce the method of paying for fire protection described herein, and the city electing to extend the franchise, the method of paying for fire protection has now been in force there for the last two years, and has given satisfaction.

The value of the Freeport plant in April, 1912 was found to be $316,000 (population about 19,000). New extensions and enlargements were recommended which would increase this amount to $502,927. A fair return on this amount was recommended to be such that it would at no time fall below 7 per cent, after due allowance for all expense of operation and depreciation. This called for a return within four years of at least $70,000.

From a careful analysis, it was found in this particular case that 44 per cent of the total investment was necessary for fire protection, and 56 per cent for domestic consumption, and it was recommended that the city raise its payment for fire protection from a total of $10,000 (the amount then paid) to $15,000 in 1915, and $19,800 later. A corresponding reduction was made in the rates to small consumers.

The apportionment of the fire protection cost was made on the basis herein described, and resulted as follows:

For each hydrant the annual sum of $7.50 to cover interest, maintenance, and depreciation.

For future extensions as follows:

$0.10 annually per foot of 20 inch pipe
.08 annually per foot of 16 inch pipe
.06 annually per foot of 12 inch pipe
.05 annually per foot of 10 inch pipe
.04 annually per foot of 8 inch pipe
.03 annually per foot of 6 inch pipe
.02 annually per foot of 4 inch pipe

No pipe smaller than 4 inch was recommended, and 4 inch not to be used for greater lengths than 1000 feet between cross mains.

For private fire protection services:

Private hydrants $7.50 annually per hydrant.
$0.06 annually per foot of 6 inch supply pipe.
.04 annually per foot of 4 inch supply pipe.

The charges per foot of private fire protection supply pipe being higher than charged the city, because such supply pipe affords no revenue from domestic consumers.

For sprinkler service:

An initial payment of the entire cost of the supply pipe, safety valves, etc.

For each sprinkler head $0.05 annually.

Minimum charge $50 per annum.

The above findings are only given to illustrate the working out of the system. Each case requires to be investigated by itself, and may result in very different figures owing to special local causes.

It is to be hoped that the suggestions here contained will commend themselves to those cities or companies about to renew fire protection contracts, so that past causes for fruitless difficulties and friction may be avoided, and especially is it possible for the new public utility commissions to introduce such a method as is here outlined, because they have it easily within their power to adjust rates to a just and scientific basis, equitable to both the public and the private consumer, without bargaining or pressure from political or personal interest.